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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/633,152	08/01/2003	Rodney S. McKenzie	RAYO 9324(RP-1610A)	5432
49376	7590	07/25/2006	EXAMINER	
SENNIGER POWERS (RAYO)			WILLIAMS, SHERMANDA L	
ONE METROPOLITAN SQUARE			ART UNIT	
16TH FLOOR			PAPER NUMBER	
ST. LOUIS, MO 63102			1745	

DATE MAILED: 07/25/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/633,152

Applicant(s)

MCKENZIE ET AL.

Examiner

Shermanda L. Williams

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 22 June 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-62 is/are pending in the application.
- 4a) Of the above claim(s) 13-15 and 17-62 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-12 and 16 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 01 August 2003 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

NICKEL-PLATED SCREEN FOR ELECTROCHEMICAL CELL

Examiner: Williams

S.N. 10/633,152

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Election/Restrictions

1. Applicant's election of Group I in the reply filed on 06/22/2006 is acknowledged. Because applicant did not distinctly and specifically point out the supposed errors in the restriction requirement, the election has been treated as an election without traverse (MPEP § 818.03(a)).

Drawings

The drawings are objected to because Figure 6 does not adequately display what the applicant is referring to as drawing detail **114**. Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If

the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Double Patenting

Applicant is advised that should claim 6 be found allowable, claim 16 will be objected to under 37 CFR 1.75 as being a substantial duplicate thereof. When two claims in an application are duplicates or else are so close in content that they both cover the same thing, despite a slight difference in wording, it is proper after allowing one claim to object to the other as being a substantial duplicate of the allowed claim. See MPEP § 706.03(k).

Claim Objections

2. Claim 4 is objected to because of the following informalities: improper group language. Examiner suggests "deposited by.... sputter deposition or chemical deposition". Appropriate correction is required. See MPEP 2173.05h

Claim 16 is objected to because of the following informalities: claim 16 is a duplicate of claim 6 and therefore does not further limit claim 5. Appropriate correction required.

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

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(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. Claims 1, 2, 5, 6, 10, 11, 12, and 16 are rejected under 35 U.S.C. 102(b) as being anticipated by Howard et al., US 4,476,002. Howard teaches a metal current carrier for use in constructing air cathodes for electrochemical cells. The current carrier is a thin nickel screen with metal particles sintered to the surface of the screen on one side (col. 3 lines 10-15). The coarse metal particles bonded to the nickel wire (col. 4 lines 26-27) produce a conductive and mechanically supportive mesh. The coarse metal particles provide a rough textured surface (one having nodules) and increase the interfacial layer surface area of the screen (col. 3 lines 28-30). The metal particles bonded to the nickel wires are 4.1 to 5.8 mils in length (col. 5 lines 5-7 and claim 1). The metal particles bonded to the nickel wire to produce the current carrier are normally made of the same material as the wire (col. 4 lines 48-51 and claim 21). Activated carbon and PTFE (disposed on the outer surface) are used in the active layer of the electrode as the active material and binder (col. 8 lines 11-15 and claim 27). The current carrier contains the transitional metal, silver (claim 20). The columnar grains are formed due to the relationship of the particle size and the mesh spacing (col. 4 line 60 to col. 5 line 7). The particles are no smaller than 1/20th the size of the mesh opening, thereby forming columnar grains over the surface.

5. Claims 3 and 4 rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Howard. Howard teaches depositing a catalyst by electroplating techniques (col. 6 lines 8-12; col. 8 Example 1).

Thus the claims are anticipated.

6. As well, claims 3 and 4 are product-by-process claims. The claims are alternatively unpatentable. The courts have ruled that product-by-process limitations, in the absence of unexpected results, are obvious. See MPEP 2113. The products of claims 3 and 4 and that of claim 2 appear to be the same. Both the cited reference and the claimed invention teach a mesh with metal deposited on its members.

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

8. Claims 1, 2, 3, 10 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kadija (US 4,423,252) in view of Venkatesan et al. (US 6,998,184).

9. Kadija discloses a method for producing a reticulate electrode for electrolytic cells. The method comprises forming a network of filaments bonded at their contact points (see abstract). Comparative Example A teaches the electroplating of a nickel mesh or wire screen by inserting the screen into a nickel sulfamate bath. Where the filaments touch in the grid layout (at the longitudinal and lateral contact points of the screen), nickel forms bonds by electroplating (see col. 5 lines 1-42 and claim 1).

10. Venkatesan et al. discloses a hybrid fuel cell/battery comprising a fuel cell portion and a rechargeable battery portion both housed in the same enclosure and sharing at least one reactant. The fuel cell and rechargeable battery can operate independently

or collectively. The fuel cell portion (col. 7 lines 15-26) of the hybrid cell/battery may be a metal air cell sharing its metal anode with the rechargeable battery (col. 4 lines 59-64 and col. 6 lines 33-37).

11. The multilayered cathode of the metal air cell has an active material layer and a gas diffusion layer (col. 10 lines 15-20). The wire grid or mesh current collector has 40 wires laid horizontally or laterally and 20 wires laid vertically or longitudinally to form the screen (col. 11 lines 59-63). The active material layer of the electrode is formed of carbon particles coated with PTFE (col. 10 lines 26-28) and positioned on top of the diffusion layer. The PTFE acts as a binder (col. 9 lines 65-67).

12. It would have been obvious to one having ordinary skill in the art at the time of the invention to comprise the screen of nickel wire and electroplate the bonding metal onto the mesh for adhesion. The strong electroconductive mesh provides strength and constant contact during the electrolytic process. The use of PTFE is to bind the active material over the life of the electrode (col. 9 lines 54-57).

13. Claim 3 rejected under 35 U.S.C. 103(a) as being unpatentable over Howard. Howard teaches depositing a catalyst by electroplating techniques (col. 6 lines 8-12; col. 8 Example 1). It would have been obvious to one having ordinary skill in the art at the time of the invention to deposit the catalyst in such a manner to ensure proper adhesion or bonding between the members of the mesh.

14. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kadija, Venkatesan et al., and further in view of Corrigan (US 4,663,256). Corrigan discloses a nickel electrode having an improved substrate containing dendrites. The dendrites or

nodules on the substrate increase the surface area. Therefore, the dendrites or nodules on the substrate surface improve the adhesive interaction between the substrate and the active layer and thereby reduces the interfacial resistance (col. 2 lines 56-61) Corrigan teaches that the dendrites increase the surface area of the current collector in communication with the active material (col.3 lines 16-24). Testing conducted using nickel current collectors having dendrites and current collector having other abrasions showed that the dendrite current collector had the better performance (col. 4 line 58 to col.5 line 5). The presence of dendrites or nodules on the nickel wires of the cell increases the surface contact between the nickel screen and the active layer of the cathode. It would have been obvious to one having ordinary skill in the art at the time of the invention to form nodules on the surface of the nickel screen to improve cell performance.

15. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kadija, Venkatesan et al., and further in view of Corrigan. The dendrites as taught by Corrigan, form the columnar grains when attached to the rough mesh or screen surface (Figure 5; col. 4 lines 22-29). Sand blasting before the dendrite layer of nickel is added to the substrate forms a rough or pitted surface to promote better nucleation of the dendrites when they are attached. It would have been obvious to one having ordinary skill in the art at the time of the invention to construct the outer of surface of the mesh in a manner to include columnar grains at the application of the dendrite layer. This ensures better nucleation.

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16. Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Howard. Howard teaches the formation of grains by way of disclosing the particle size and the mesh or screen opening size relationship. The size of the columnar grains depends directly from the mesh and particle size relationship. This reference is silent in regard to the exact grain diameter but it does teach that the particles forming the nodules should be in the range of 1/20th to 1/2 the spacing of the mesh openings (col. 4 line 60 to col. 5 line 7). It would have been obvious to one having ordinary skill in the art at the time of the invention to choose a mesh size and nodule size that would in turn form columnar grains that allow for the proper bonding of the mesh members.

Claims 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kadija, Venkatesan et al., and further in view of Corrigan (US 4,663,256). Corriagn discloses the importance of the size and population of the nodules so that the active material in contact with the nodules is penetrated (col. 2 lines 49-56). The increase in surface area of the screen by the addition of the proper size nodules and properly spaced nodules is important to enhance the performance of the cell. Although, Corriagn does not explicitly state the diameter of the nodules, it is inherent property to produce a nodule of adequate size to project into the active material and remain in tact to sustain increased contact between the active material and nodules of the screen. It would have been obvious to one having ordinary skill in the art at the time of the invention to attach nodules to the screen having a diameter able to provide mechanical strength while increasing the contact area of the screen with the active material. The nodule diameter in the range of 10 to 100 microns is inherent. The applicant has not stated any

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unexpected results or other patentably distinct results for nodule diameters in the given range.

17. Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kadija, Venkatesan et al., and further in view of Corrigan (US 4,663,256). Corrigan teaches an aspect ratio. The aspect ratio defined as the nodule height divided by the average width (col. 3 lines 18-19). The nodule population range given by Corrigan is $10^4/\text{cm}^2$ to $10^7/\text{cm}^2$ (col. 3 lines 16-18). As well Corrigan teaches that the nodules should increase the surface area of the current collector (screen) in contact with the active material by at least a double amount or 50 percent (col. 3 lines 16-24). Also, Corrigan teaches that the placement of the nodules on the surface of the nickel at too large an interval does little to reduce the interfacial resistance between the contacting surfaces (col. 3 lines 9-16). Although Corrigan does not explicitly state the surface area values recited in claim 9, the importance of the placement or arrangement of the nodules on the nickel surface is discussed. It would have been obvious to one having ordinary skill in the art at the time of the invention to occupy between 5 and 50 percent of the surface area of the nickel to effectively increase the contact between the nickel screen and the active material.

18. Claims 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kadija, Venkatesan et al., and further in view of Corrigan (US 4,663,256). Corrigan teaches the addition of cobalt hydroxide to the electrode for the purpose of improving the charging of the electrode (col. 1 lines 43-46). It would have been obvious to one having ordinary

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skill in the art at the time of the invention to add a transition metal such as cobalt to the nickel wire of the screen to improve the charging of the electrode.

19. Claims 7-9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Howard. The discussion presented by Howard as to the mesh and particle dimensions of the screen would render the claimed dimensions obvious (col. 4 line 60 to col. 5 line 7). Furthermore, the courts have held that where the only difference between the prior art and the claimed invention was a recitation of relative dimension(s) of the claimed device and the device having the claimed relative dimensions would not perform differently than the prior art device, the claimed device was not patentably distinct from the prior art device. See MPEP 2144.04.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure: Shun et al. US 6,127,061 teaches an improved air cathode used in metal-air batteries.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Shermanda L. Williams whose telephone number is (272) 571-8915. The examiner can normally be reached on Mon.-Thurs. 7 AM - 4:30 PM and alternating Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick Ryan can be reached on (272) 571-1292. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.


TRACY DOVE
PRIMARY EXAMINER

7/06